UNC PEMBROKE | MAYNOR HONORS COLLEGE

The Impact of Food Types and Lifestyle on Diabetes and Cholesterol Levels

Senior Project

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By

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Abstract

This research is focused on the effect of the different types of food and lifestyles on diabetes type II and cholesterol levels. Different Lifestyles and types of food from countries located in the West, East and Middle East were studied and compared. Data of blood glucose and cholesterol levels were compared for each of the following countries; United States, Egypt, and Republic of Korea (South Korea). The purpose of this research was to relate the relationship between two diseases: diabetes type II and high cholesterol to the lifestyle and type of food of the different cultures and countries among Western, Middle Eastern and Eastern nations.

The Impact of Food Types and Lifestyle on Diabetes and Cholesterol Levels

Introduction:

Each country has its different and unique culture, food, and location. Moreover, depending on the environment and opportunities, sometimes the country shapes the lifestyle of the individual; perhaps the full population. Some populations exhibit a specific disease or immunity to a disease more than the others; could that be due to genes, food, or lifestyle? Could different types of food and lifestyle have an impact on the type of disease a population could have?

Going across the globe from east to west, it is very hard to study every country; so three countries were chosen to represent the East, Middle East, and West. These countries were chosen because personally I have had experienced their food types and lifestyles. The United States was chosen to represent the West, Egypt to represent the Middle East, and South Korea to represent the East. The background of each of these countries was studied and compared including the location, history, food, lifestyle, and data levels of obesity, blood glucose, cholesterol, and blood pressure.

Diabetes and high cholesterol are two common diseases that are spread across the whole globe. In addition, it is known that diabetes and cholesterol levels are directly related to the food choices and amount of excise in one's daily life. Diabetic patients are asked to regulate and watch their food choices and excises daily to control their blood glucose. As well as patients with high cholesterol levels are asked to avoid fast food and eat healthy. So this project will be focused on the comparison of specifically diabetes and cholesterol diseases because they are related to food intake and lifestyle.

In addition to comparing the data levels between the three countries a deeper study of the metabolic pathway and chemical approach of one common food from the country with the lowest data levels of diabetes and cholesterol was conducted.

Background:

Understanding the background, history, and foods of each country helps to understand the relationship between the foods, meals and lifestyle and the prevalence of a disease among the country's population. Several factors can have an effect on bodily functions, metabolism rates, and the overall health. Among the different factors, the type of foods and meals contribute to about eighty percent of the effect on the body and the health of a person. However, the other twenty percent are the effect of the lifestyle, exercise, weather, and many other factors one could get in contact with.

The Republic of Korea:

The climate of The Republic of Korea resembles the north central region of the United States; cold winters, warm summers and long pleasant fall. The South Korean food is related directly to the country's location, geography and climate. Rice, beans and vegetables are grown in the valleys while in the mountains mushrooms and many wild plants such as bracken and bellflower are either collected or cultivated (Breakfast, lunch and dinner in Korea). On average, a person in South Koreans eats three meals per day. A typical breakfast consists of foods that can be used for any meal of the day such as lunch or dinner such as soups, rice, side dishes, kimchi, spinach, spicy cucumbers, and cooked fish. Grilled meat is sometimes avoided because it is considered a heavy food item to be consumed for breakfast. A typical lunch contains rice, soup, side dishes, and kimchi. Some of the food that is eaten for lunch is grilled marinated beef, different types of soups,

meat dumplings, and Korean short ribs. A typical dinner is not very difference from any other meal of the day, consisting of elements such as rice, soup, side dishes, and kimchi.

Egypt:

The climate of Egypt varies from Mediterranean warm winter to a very hot summer. The Egyptian food is related directly to the country's location, geography and climate. Winter vegetable and fruits are found only in the winter as well as summer harvests. A person living in Egypt would eat three meals per day on average along with hot black tea served after each meal. Meal times in Egypt tend to be in different from eastern and western countries. Breakfast is eaten till 9 am, lunch is eaten between the times of 1:30 pm and 3:30 pm, and dinner is between the times of 7 pm and 9 pm. A typical breakfast contains pita bread, hummus, falafel, pickled vegetables, fool (fava beans), cheese, and eggs. Lunch is considered the main meal of the day and a time for the family to come together. A typical lunch consists of meat, poultry or fish, lentils, bread, cooked vegetables and rice; Along with salads and side dishes. Dinner is considered the lightest meal of the day. A typical dinner consists of dairy products as well as some light food from breakfast such as fool.

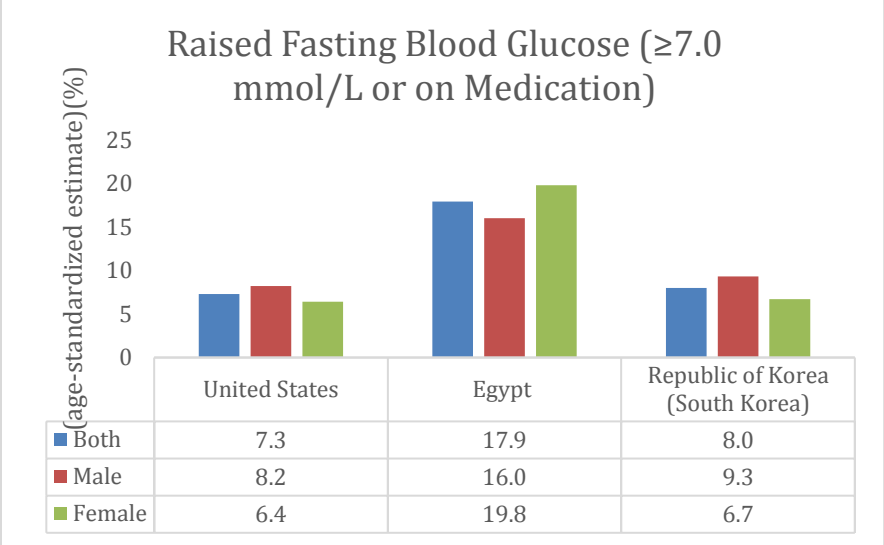
The United States of America:

The climate in the United States varies among states, cold in winter and very hot in summer. On average, a person eats three meals per day along with snack between meals; each meal has its unique, different food. A typical breakfast often consists of either cereal-based or egg-based dish as well as pancakes or waffles. Some foods that are eaten during breakfast include and not limited to cereal, eggs, bacon, ham, bagel, toast, muffins or pastry, cream cheese, grits, and oatmeal. A typical lunch would include cold

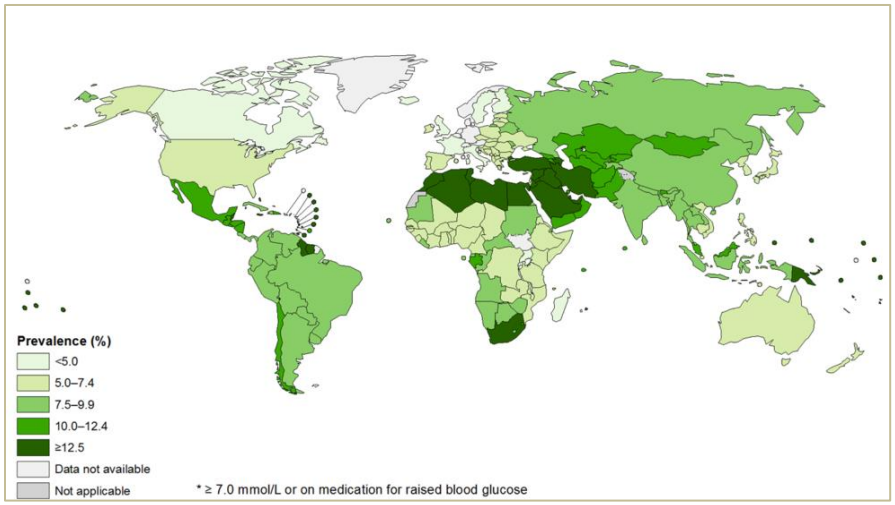
cuts sandwiches which are the most common food item for lunch, soups, or salads. A typical dinner is usually served with bread and a side salad. Dinner contains cooked meals such as baked chicken, baked pork chops, steak, lasagna, and meatloaf. Fast food is easily accessed and available everywhere during any time.

Collected Data:

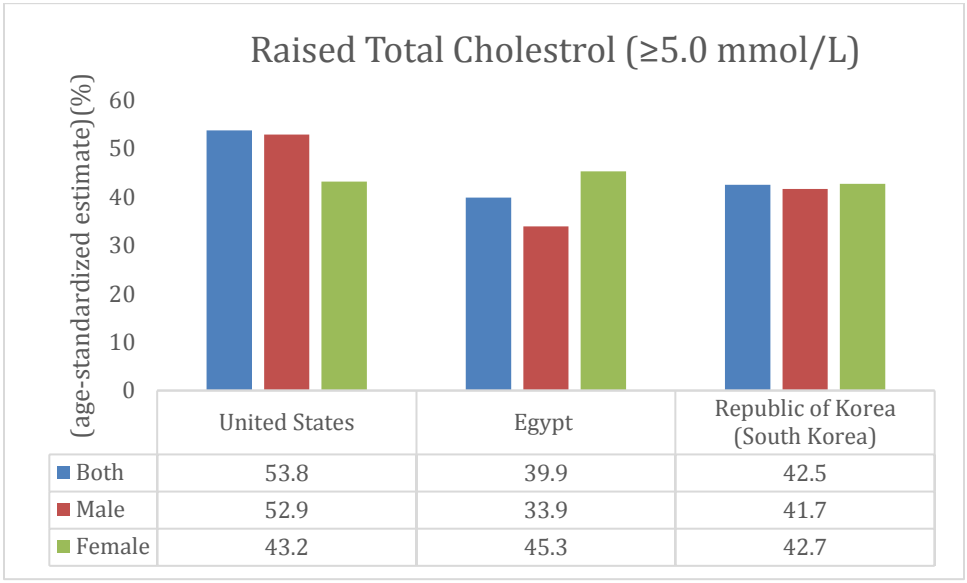
The following two figures represent data for raised fasting blood glucose (≥7.0 mmol/L or on medication) for each of the following countries: United States, Egypt, and South Korea. Data represented for male, female, and both in age-standardized estimate percentage (first figure); Along with a worldwide map with color coded data for each country (second figure).



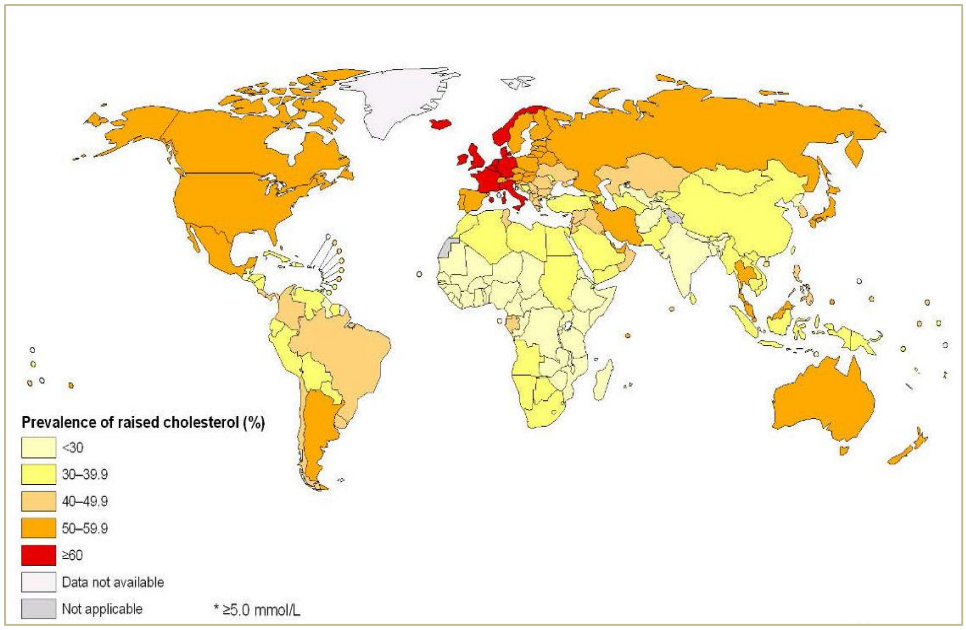
	United States	Egypt	Republic of Korea (South Korea)
Both	7.3	17.9	8.0
Male	8.2	16.0	9.3
Female	6.4	19.8	6.7



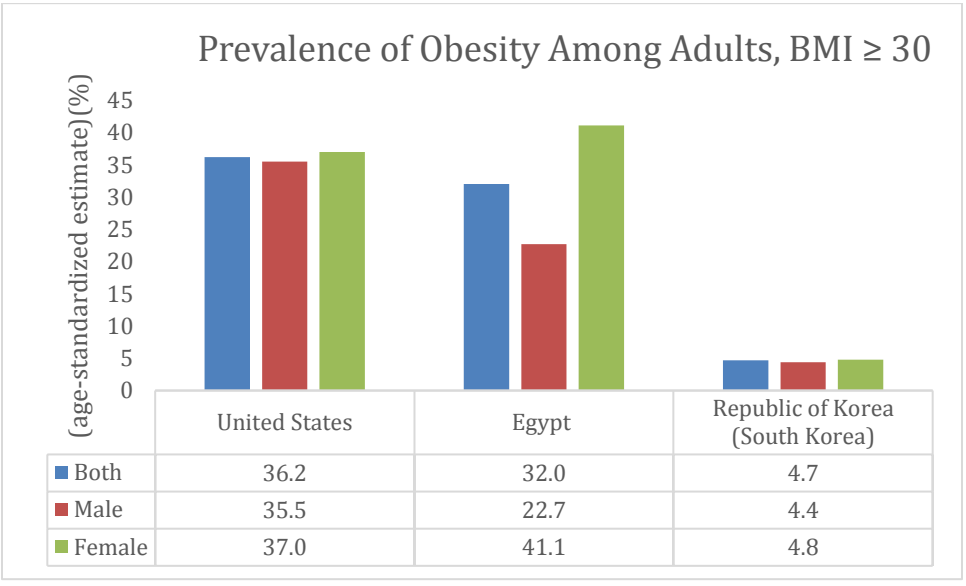
The next two figures represent data for raised total cholesterol (≥5.0 mmol/L) for each of the three countries. Data represented for male, female, and both in age-standardized estimate percentage (first figure); Along with a worldwide map with color coded data for each country (second figure).



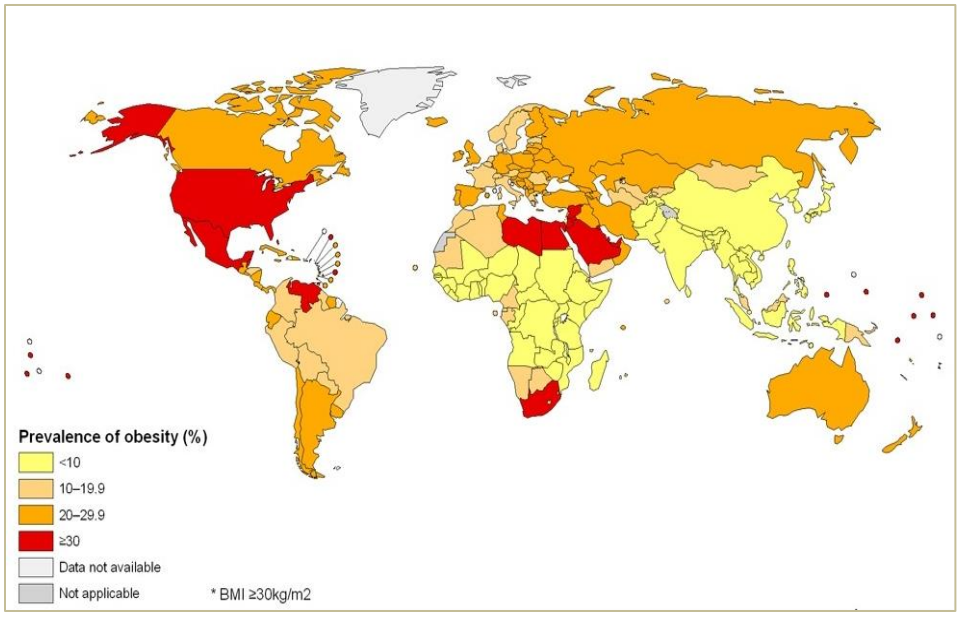
	United States	Egypt	Republic of Korea (South Korea)
Both	53.8	39.9	42.5
Male	52.9	33.9	41.7
Female	43.2	45.3	42.7



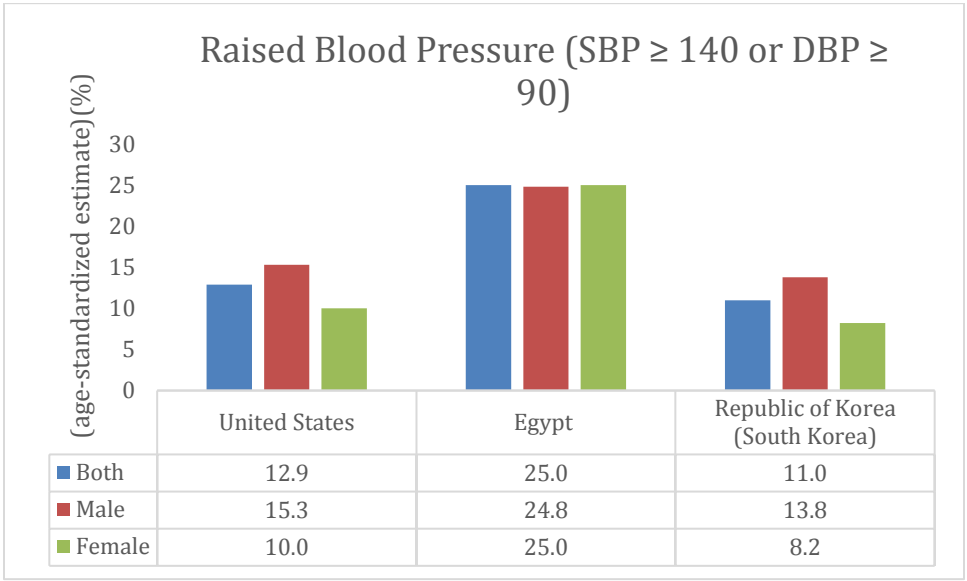
The following two figures represent data for prevalence of obesity among adults (BMI ≥ 30) for each of the three countries. Data represented for male, female, and both in age-standardized estimate percentage (first figure). Along with a worldwide map with color coded data for each country (second figure).



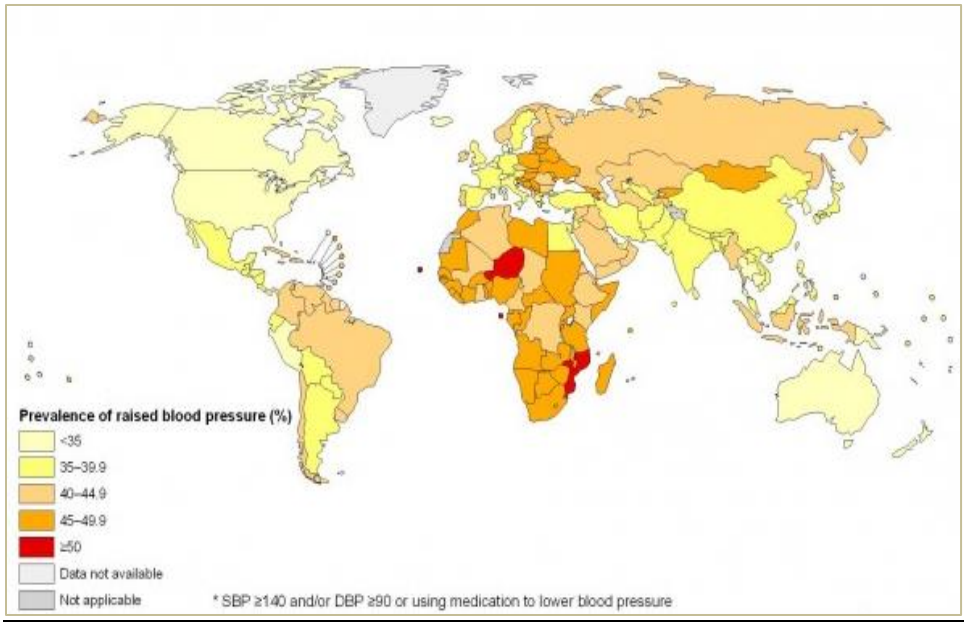
	United States	Egypt	Republic of Korea (South Korea)
Both	36.2	32.0	4.7
Male	35.5	22.7	4.4
Female	37.0	41.1	4.8



The next two figures represent data for raised blood pressure (SBP ≥ 140 or DBP ≥ 90) for each of the three countries. Data represented for male, female, and both in age-standardized estimate percentage (first figure). Along with a worldwide map with color coded data for each country (second figure).



	United States	Egypt	Republic of Korea (South Korea)
Both	12.9	25.0	11.0
Male	15.3	24.8	13.8
Female	10.0	25.0	8.2



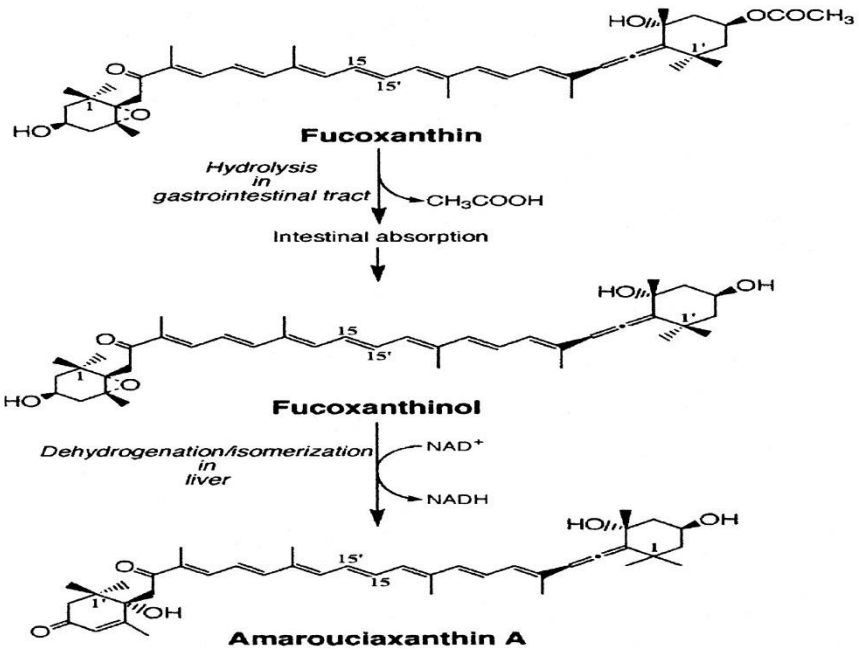
Data Interpretations and Discussion:

According to WHO (World Health Organization), The United States shows the highest percentage of cholesterol data. Studies have shown that fast food has a huge effect on cholesterol levels in the blood, especially the bad cholesterol. Fast food meals tend to raise cholesterol levels three times any other healthy or cooked meals. United States diets and eating habits tend to contain many fast food meals; because fast food is cheap and easily accessed. However, in Egypt fast food tend to be very expensive, not favored and not considered to be a major contributor to one's diet.

According to the data obtained from WHO, Egypt has the highest blood glucose levels among the other countries. However, there is not a huge difference in data between South Korea and United states regarding blood glucose levels. To understand or predict the reasons behind the Egyptian population showing the highest levels of blood glucose levels, data was referred and compared to the prevalence of obesity among adults. Since obesity increase the risk of diabetes and heart disease, it is expected that the data for both blood glucose and obesity to show some correlation between the two data; however, the

data didn't show any similarities. The United States had the highest data of obesity among its population, Egypt had second to the highest and South Korea had extremely very low percentage of obesity. According to this data, one of the reason that could be predicted for Egypt to have a very high blood glucose levels could be due to lack of medicine and health care. People in the United States tend to have a good health care, thus they can have a better control over blood glucose levels than others with no medication; which will lead to lower data. To relate to reason that South Korea has an extremely low percentage of obesity, the metabolic pathway of one of the most eaten food, seaweed, was studied.

Along with kimchi being very popular side dish found in every Korean household, seaweed is considered to be one of the most common foods eaten on the east coast; not only in South Korea, but also in japan, china and other Asian countries. Brown sea weed is rich in a compound called Fucoxanthin which is a carotenoid. The structure of Fucoxanthin is shown in the figure below. As the body metabolize seaweed, Fucoxanthin is converted to its metabolites depending on the reactants and location in the body such as the liver and white adipose cells.



Edible brown seaweed is digested and broken down to nourish the body with carotenoid Fucoxanthin, which is fat soluble and mixed in micelles to be absorbed in the small intestines. Once Fucoxanthin gets absorbed in the small intestine; its metabolites fucoxanthinol, and amarouciaxanthin-A are produced upon several cellular metabolism reactions. Studies had showed that a healthy diet with a regular amount of seaweed can decrease blood glucose, decrease the risk of obesity, lower cholesterol, act as an anticancer, increase metabolism rate, and increase sensitivity of cells to insulin. In addition, it has many nutritional values, minerals and vitamins the body needs. Excessive accumulation of fat and white adipose tissues in the body can lead to serious diseases such as: type II diabetes, hyperlipidemia, hypertension, and cardiovascular diseases. Fucoxanthin and its metabolites show a great anti-obesity effect. They inhibit fat absorption, decrease the activities of adipocytes fatty acid synthesis, hepatic fatty acid and triglyceride synthesis, cholesterol-regulating enzymes and the plasma and hepatic triglyceride levels. In addition, they increase the concentration of plasma high-density

lipoprotein-cholesterol as well as fatty acid oxidation enzyme activity in white adipose tissues. Many studies suggest that the anti-obesity effect of Fucoxanthin is due to the oxidation of fatty acids, and energy dissipation through upregulating the expression of uncoupling protein 1 in the white adipose tissue.

Since studies has shown that one of seaweed health benefits is to decrease the risk of obesity by blocking the adipose tissues, it could conclude that seaweed in the south Korean diet could be one of the reasons that South Korean population is exhibiting extremely low percentage of prevalence of obesity among adults.

Conclusion:

The type of food and lifestyle have a huge impact on the levels of diabetes and cholesterol indeed; as well as on obesity, and high blood pressure levels. Healthy diet and exercise lowers the levels of blood glucose in the blood and help to regulate the secretion of insulin in the blood. Elimination of fast food tend to help reduce the levels of bad cholesterol in the blood. Studies has shown that fast food tend to raise cholesterol levels in the blood three times any healthy cooked meal. Three countries were chosen to represent the different regions in the world and studied to illustrate the relationship between food types, lifestyles and the prevalence of diabetes and cholesterol among the populations. Among the countries that were studied; Republic of Korea (South Korea) showed the lowest data of obesity, blood pressure, and cholesterol levels. Adopting a healthy lifestyle and diet is very important to the overall health and to reduce the risk of heart diseases.

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